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Micro-scale preformed particle gel/surfactant eor process for high temperature and hard brine reservoir

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Abstract

© SGEM2018. X reservoir is a high temperature (97 ℃), high salinity (TDS 204600 mg/L, divalent cation 11480.34 mg/L), middle-low permeability sandstone reservoir located in Tarim Basin (China). Serious vertical and lateral heterogeneity of formations resulted in the injection water channeling from higher permeability pathways. The harsh conditions make it difficult to further improve oil recovery. This paper provides a micro-scale preformed particle gels (micro-PPG)/surfactant EOR process for X reservoir. The micro-PPG with an average particle sizes of 5-6 microns were prepared by the successive five procedures: synthesis, shearing, drying, smashing, and sieving. The long-term stability of the micro-PPG was evaluated under reservoir temperature and salinity by measuring swelling capacity, diversion pressure and toughness. The reducing IFT ability of the surfactant was studied under reservoir temperature and salinity. The interactions of the surfactant and micro-PPG was also investigated. The results indicated that the 0.2 wt% surfactant obtained a stable ultra-low interfacial tension (IFT) of 3.4×10-3 mN/m with crude oil after aging for 90 days. The micro-PPG still remained a higher diversion pressure of 73.8KPa than the initial value (70.8KPa) and a high toughness index of 0.82 after aged for 90 days, which indicates the micro-PPG had an excellent temperature and salt tolerance. An additional oil recovery of 20% was obtained by flooding experiments.

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Keywords

EOR, High-Temperature and Hard-Salinity Reservoir, Micro-scale preformed particle gel, Surfactant

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